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ABSTRACT

The Cognitive Enrichment Network Education Model (COGNET) is a program designed to enable children to achieve greater school success by establishing a school-based community of learners. This paper describes COGNET and presents several studies on its effectiveness. The paper begins with a discussion of the model's basic assumptions on child learning and principles for successful educational reform. It then describes the program's background and theoretical framework, namely its emphasis on mediated learning, and its three components: classroom, parent-school partnership, and community-school network. The bulk of the paper describes several studies in two main areas of COGNET's effectiveness--academic achievement and teacher behavior. Details are provided on samples, instruments and procedures, data collection and analysis, and results. Additional studies on student motivation, attention, classroom behavior, and parent involvement are also briefly described. Overall results indicate a positive contribution by COGNET. Contains 24 references. (EV)

Running head: COGNITIVE ENRICHMENT NETWORK

The Cognitive Enrichment Network Education Model (COGNET)

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The Cognitive Enrichment Network Education Model (COGNET)

Introduction

The Cognitive Enrichment Network Education Model (COGNET) is a program designed to enable children to achieve greater school success by establishing a school- based community of learners. In this manner high-risk and/or underachieving children can develop thinking skills and increase cognitive skills. COGNET provides a framework for systematic change, establishes a school-based community through which parents, teachers, and other education, health, and social services professionals work together, and help all children become effective independent, life-long learners. COGNET maximizes learning potential so that children are able to adapt to an ever-changing world and act as responsible members of society. In addition, teachers are able to improve the ways in which they interact with children in the classroom to better facilitate the higher order thinking and learning of each child. COGNET is designed for use by regular and special program teachers, professional support staff, and paraprofessionals working with high risk and /or underachieving children primarily in kindergarten through sixth grade.

Basic Assumptions and Beliefs

The following are assumptions and beliefs upon which COGNET is based. It is believed that children learn in social contexts when adults especially parents and teachers, act as mediators of learning experiences. School success is dependent on children's opportunities to actively explore new ideas and with the help of a mediator, and to expand their own personal world views of how the world works by making a connection between the two. The main task of COGNET is to find ways to prevent learning problems and disabilities, cultural alienation, and poverty from becoming impediments to independent learning. It is important to address the needs of the whole family, not just the child as a student in the classroom. School is the place that children practice the skills obtained from parents, teachers, as well as other students.

COGNET is based on three premises believed critical in the success of educational reform. First, reform efforts by educational institutions must be based on sound educational approaches that are supported by theory, philosophy, and research. Second, educational reform is determined by the

effectiveness of professional development. This should involve long-term partnerships with outside experts who can provide sustained technical assistance over a period of several years. Third, educational reform succeeds best in a collaborative environment with genuine community-inclusive support and ownership, both top-down and bottom-up.

Background, Foundation, and Theoretical Framework

The first to discuss the notion of mediated learning was Lev Vygotsky, a Russian psychologist. He believed our cognitive skills are developed as a result of mediated learning experiences. This learning occurs when we "learn" something in collaboration with a more capable person such as a teacher, parent, or another student. This process furthers cognitive development (Vygotsky, 1978).

Another psychologist, Dr. Reuven Feuerstein, from Israel, developed his theory of Mediated Learning Experiences (MLE) in 1980. His theory expanded on Vygotsky's theory and further discusses cognitive enrichment which includes an explanation of how children learn to learn. It is described as a social constructivist view of learning in that it explains how children construct a meaningful world through the reciprocal interactions they have with more competent others who share a system of cultural meanings and values (Feuerstein, 1980; Feuerstein, Klein, & Tannenbaum, 1990). At the same time, MLE theory enhances our understanding of the specific cognitive processes, deficits, and unproductive affective/ motivational approaches to learning that occur in individuals who are underachieving due to cultural alienation, poverty, language deficit, and /or disability. It also addresses how to prevent or overcome these deficits.

When mediated learning is provided as a part of cognitive enrichment, the techniques utilized can help all students to gain more thus providing more meaningful connections between the student and the information as well as a stronger connection between what is being taught in the classroom and what one needs to be successful beyond the classroom. Schools must provide relevant experiences for children. Indeed, schools must move away from the traditional view of education where students must master surface level, decontextualized, basic skills before moving to challenging, complex and authentic tasks (Preseissen, Smey-Richman, & Beyer, 1992).

Several intervention and prevention programs based on MLE theory to enhance learning potential have been developed and used in many countries (Feuerstein, Klein, & Tannenbaum, 1990;

Greenberg, 1990). A growing body of research provides support for the effectiveness of programs based upon it (Dale & Cole, 1988; Coulter & Greenberg, 1994; Haywood, 1994; Greenberg, 1992; Greenberg, Coleman, & Rankin, 1993; Greenberg, Woodside, & Brasil, 1994; Klein & Alony, 1993).

Program Components

The COGNET program is designed to affect all aspects of the school-based community. The program includes classroom, family, professional development and networking components within the schools and throughout the community. The three key components of the program include:

1. a mediated learning classroom approach that combines best practices in education with a unique approach to teaching children how to learn,
2. a parent/school partnership program that helps parents and school work more closely together in ways that meet specific community needs to ensure children's success through education,
3. an implementation network that connects participants with COGNET implementors in a wide variety of other settings and ensures effective leadership on site.

Classroom Component

Teachers introduce and encourage students use of the ten Building Blocks of Thinking and the eight Tools of Independent Learning. These two sets of techniques provide an explanation as to how learning can be more efficient and provide students with an opportunity to better focus their attention. This process is completed while engaging the students in challenging personally relevant and cooperative learning activities. In addition, teachers work on improving the ways in which they interact with children in the classroom. Not only does this increase the teacher's ability to communicate with the students, it enables the teacher to facilitate higher order thinking skills of the student. This is accomplished by incorporating activities that challenge the students and provide personally relevant material. Cooperative learning, project oriented group activities are used in COGNET classrooms, many of which incorporate computer software simulations.

Parent/School Partnership Component

The family component involves the parents reinforcing the use of Building Blocks and Tools in activities outside the classroom. Examples include shopping, social events with friends, completing chores/job, etc. Further involvement by the parents is encouraged through their participation on

advisory committees as volunteers in the classroom, as well as through participation in various school-based self-improvement activities.

Community/School Network Component

Collaboration within and across schools and their communities is facilitated through the COGNET approach. Teaching staff meet regularly to share their successes and challenges. Parent Advisory Boards provide a formal means for parent leadership. Business/school partnerships are encouraged. In addition, COGNET university staff sponsor collaborative activities across school including an annual COGNET Leadership Conference.

In an ideal situation, the program is implemented with school staff and families simultaneously. Parents reinforce concepts introduced at school. A program coordinator facilitates networking for parents and teaching staff. This coordinator is responsible for organizing and conducting ongoing training sessions, providing support to teachers and parents, and maintaining the link between elementary and pre-schools. In addition, a Comprehensive Services Coordinator facilitates linkages to health and social services for children, and coordinates educational opportunities for parents. Administrative personnel at the school and central office level participate actively in all aspects of the approach.

Requirements

For greatest success, the COGNET Education Model strongly encourages school systems to engage in specific activities prior to implementation. These include: 1) completion of a needs assessment questionnaire, 2) agreement by teachers to participate in workshops, attend support meetings and implement the program for at least two consecutive years, and 3) agreement by school staff to schedule 30-36 hours of workshop sessions during year I and 18-20 hours of workshop sessions during year II with a minimum of 4 days follow-up consultation and feedback.

Evidence of Effectiveness

A three year research project of children, teachers, and parents in one experimental and one comparison school was completed in 1991. A second, much larger research project, including three experimental schools and two comparison schools, was completed in 1994. As a result of these compiled research findings, COGNET was approved for validation by the U.S. Department of Education National Diffusion Network's Program Effectiveness Panel in march of 1995.

Impact on Student Academic Achievement

The results of studies investigating COGNET impact on student academic achievement indicate the following:

High risk students in the COGNET schools made greater gains overall than comparison groups on standardized tests of basic skills as reflected by gains exceeding those expected based on national norms, gains in NCE scores, and in significant decreases in the percent of students scoring below average on standardized achievement tests. Four studies provide evidence for these academic achievement claims.

Study 1: Differences in Academic Performance Exceeding Expected Gains.

Tennessee Comprehensive Assessment Program (T-CAP) scale scores for reading, language, and math for cohorts of students were analyzed to determine differences from expected gains, i.e., the number of scale score points necessary to keep pace with the national norm curve at the 50th percentile as determined for each subject area by the publisher of the test, (CTBS Macmillan/McGraw-Hill). Each treatment cohort of 2nd - 5th grade students in a given academic year was compared to students in comparison group and all schools combined within their LEAs. Differences are based on scale scores from 1991-92-93 test administration for students who were in attendance a minimum of 150 days in a given school year and who were not classified as special education students.

Study 2: Normal Curve Equivalency (NCE) Student Gains.

T-CAP NCE gains for cohorts of students in five urban elementary treatment and comparison schools were analyzed to determine the effect size of gains in reading, language, and math. The treatment group consisted of 2nd, 3rd, and 4th grade students in classes where documentation of full implementation of the program was available. The comparison group consisted of students in environmentally similar schools at the same grade levels. Gains were derived from student individual score differences from 1993 to 1994. Effect size was selected as the most appropriate statistical analysis to determine differences between groups due to the lack of randomization of student assignment to groups.

Study 3: Academically At-Risk Student NCE Gains.

Stanford Achievement Test (SAT) NCE gains for cohorts of students designated as academically at-risk in a rural, southern Appalachia elementary treatment group were compared to gains made by academically at-risk elementary school students in a small town within the same LEA. Appropriate pretests were administered prior to program implementation as early as 1988 to kindergarten through 2nd grade students. Post tests were administered in 1991 to pretested treatment group students who had received two or more years of the program and to comparison group students who had pretest scores in 1st through 4th grades. Multivariant analysis was used to determine the significance of the differences in the two groups.

Study 4: Decrease in Percent of Students Scoring Below Average.

NCE reading, language, and math scores for cohorts of students who attended first grade in 1991 and 4th grade in 1994 were selected from two urban elementary treatment schools and their environmentally similar comparison school. The percent of students scoring below average in each cohort were compared. Data were obtained from performance on the appropriate T-CAP tests.

All four studies used comparison groups in an attempt to control for the change in student data that could be attributed to maturation. Primary outcome indicators of academic achievement were based on standardized norm-referenced tests which helped to insure that the data generated were equivalent between the treatment and comparison groups. The reliability and validity of the dependent variables can be determined accurately since they were developed using established psychometric methods by test publishers. Reliability of the results is enhanced by the fact that the data are reported for several cohorts of environmentally and ethnically different groups of students in four different treatment schools and represent two different time periods (1988-1991 and 1991-1994).

Although the relatively small sample sizes for studies 2, 3 and 4 might limit generalizability, the findings of all the studies conducted in varying settings strengthens the claim. Use of equivalent comparison groups helps assure the accuracy of the results and improves generalizability. Pretest differences between treatment and comparison groups in study 3 limit the interpretation of its results; However, the large gains made by the treatment group as well as the consistency of results across other NCE gain studies conducted in varying settings help overcome this limitation.

Sample

The four studies presented in this proposal were conducted in treatment schools that served a large percentage of students considered to be at high risk for school failure and that receive funding as USDE Follow Through Project COGNET demonstration sites. All comparison groups were matched to their treatment groups based on grade level, geographical location, characteristics of the families served within the school, and whether or not both participated in designated Chapter I school wide programs. Table 1 displays demographic data for schools that participated in the studies. Tables 3 -7 list the schools, number of students included in each group, and the grade levels for each study.

Table 1. Description of Schools included in Studies of Student Achievement

School	Schoolwide Project Status	Percent Low Income	Percent Ethnicity	Location
COGNET A*	no	45%	1% Black 99% White	rural
Comparison X	no	45%	4%Black 96%White	town
COGNET B*	yes	98.5%	55% Black 45 % White	urban (same LEA as C & Y)
COGNET C*	yes	72%	18% Black 82% White	urban (same LEA as B & Y)
Comparison Y	yes	100%	99% Black 1% White	urban (same LEA as B & C)
COGNET D*	yes	93%	95% Black 5% Other	urban (same LEA as Z)
Comparison Z	yes	99%	99.3% Black .7% Other	urban (same LEA as D)

* Recipient of USDE Follow Through Project funding as a COGNET demonstration site

Instruments and Procedures

The two primary dependent variables are scores on standardized achievement tests including: the nationally normed component of the Tennessee Comprehensive Assessment Program (T-CAP) [Macmillan/McGraw-Hill's Comprehensive Test of Basic Skills (CTBS/4)] used in Studies 1, 2, and 4; and the Stanford Achievement Test (SAT)--a nationally used norm referenced test used in Study 3. Reading and math scores on the T-CAP and SAT represent the total score for subtests in each area.

Data Collection

Tests were administered by teachers in all studies except Study 3 where university project staff assisted. All standardized procedures were carefully followed and supervision was provided by principals in each school. See Tables 2 -7 below for more information.

Table 2. Instruments and Procedures for Academic Achievement Claims

Instrument	Studies	Reliability/Validity	Procedure
Stanford Achievement Test (SAT)	Achievement Study 3 (1991)	available upon request	scored by TN State Testing Office
TN Comprehensive Assessment Program (T-CAP)[a]	Achievement Studies 1,2, and 4 (1993/94)	available upon request	scored by TN State Testing Office

[a]Studies 1,2 and 4 utilized the nationally normed component only which is the Macmillan/McGraw-Hill CTBS/4.

Data Analysis

For purposes of analyses in Studies 2 and 3, Normal Curve Equivalent scores (NCEs) were used. (NCEs are normalized standard scores with a mean of 50 and a standard deviation of 21.06 and are recommended for use in research projects conducted with funds from the U.S. Department of Education.) Specific data analyses for each of the four studies were conducted as follows:

In Study 1, the percent of expected gains was derived from a relatively new method of test score reporting termed Value-Added Assessment (McLean, Sanders, & Stroup, 1991). Value-Added Assessment is a highly sophisticated statistical procedure that makes it possible to better measure

improvement of individual students and to pinpoint the strengths and weaknesses of educational programs. It focuses on the degree to which children meet value-added standards for scale score gains from one year to the next as defined by the publisher of the T-CAP for each subject area (see Table 3). The data presented are based on the number of scale score points necessary to keep pace with the national norm curve at the 50th percentile. The normal expected gain is expressed as 100%. Thus, a score of +20 reflects a gain 20% greater than the national average.

In Study 2, NCE gains were determined by calculating the gains for each student separately and then finding the average of these gains. NCE scores were used due to their equal interval scale and ability to track growth over time (see Table 4). They can be used to show growth from one test administration to another and to show the relative positions of two or more students, classes, etc. and to provide a gross estimate of performance. An NCE above 50 would correspond to a percentile rank in the upper half of the national sample. The claim of educational significance is based on effect size (Glass, McGraw & Smith, 1981). An effect size of .3 denotes a small effect size, .5 medium, and .8 a large effect size (Deck, Murray, Nickel, 1993.) An effect size of roughly .3 has often been accepted as the minimal practical difference (Ralph & Dwyer, 1988, p. 14). Effect sizes were calculated by subtracting the mean gains of comparison students from the mean gains of treatment students and dividing by the pooled standard deviation (Fitz-Gibbon & Morris, 1987.)

In Study 3, NCE gains were calculated by subtracting the scores obtained in 1991 from the pretest scores (see Tables 5 & 6). A multivariant analysis was used to determine the significance of the differences between the treatment and comparison groups. A one-tailed t-test was calculated on mean NCE gain scores to determine whether differences were significant. Level of significance used was the .01 level for both the MANOVA and the t-test. In order to factor out the differences in starting points of the two groups, gap reduction analysis was conducted.

In Study 4, the data presented were prepared by the Tennessee State Chapter I office (See Table 7).

Results for Studies of Academic Achievement

Overall results of Study 1, as displayed in Table 3, reflect consistently higher average percent of expected gain for COGNET students than for comparison students. The data reflect these differences for three schools in two LEAs and demonstrate the generalizability of the positive effects

of the COGNET program.

Table 3. Differences in Academic Performance from National Norm Expected Gains for Students with and without the COGNET Program in Study 1

		Achievement Test Categories		
Group[a]	(n)	Total Reading	Total Language	Total Math
		School District A		
Cognet School B	(179)	+29.8	+31.0	+19.8
Cognet School C	(181)	+11.7	+6.3	+6.4
Comparison School Y[a]	(76)	-12.7	-8.6	-12.72
School District A[b]	(16694)	+6.2	+19.2	-6.5
		School District B		
Cognet School D	(244)	+8.9	+44.0	+23.5
Comparison School Z[a]	(151)	-5.2	+29.0	-11.7
School District B[b]	(6382)	-9.6	+10.3	-6.8

Note. Data from the Tennessee Comprehensive Assessment Program (T-CAP) tests administered in 1991, 1992, 1993 were used to calculate the percent of expected gains with a procedure known as Value-Added Assessment. Differences are based on the percent above or below 100 which represents the number of scale score points necessary to keep pace with the national norm curve at the 50th percentile.

[a] Each comparison school is environmentally similar either to schools B and C or D.

[b] The district scores represent children's performance across the district for either schools B, C and Y OR D and Z.

NCE gains for students found in Study 2 and displayed in Table 4 support the findings of Study 1. Results indicate medium to large effect sizes in favor of the COGNET program

Table 4. Mean NCE Achievement Gains by Students in COGNET and Comparison Schools in Study 2

	Achievement Test Categories								
	Reading			Language			Math		
Group (n)	1993	1994	Gain	1993	1994	Gain	1993	1994	Gain
Cognet School B (63)	31.68	38.25	+6.52	32.17	37.89	+5.51	41.24	45.19	+4.65
Comparison Y (46)	44.70	42.11	-2.59	51.11	39.73	-11.38	57.71	44.80	-12.91
Effect Size[a]			+.55**			+1.00***			+1.00***
Cognet School C (22)	40.55	46.23	+5.68	43.60	45.55	+1.95	42.82	54.09	+12.64
Comparison Y[b] (26)	41.96	45.23	+3.04	53.92	42.80	-11.12	66.12	50.60	-15.52
Effect Size			+.20*			+.90***			+1.50***
Cognet School D (58)	34.75	33.34	-1.41	34.16	37.84	+3.68	38.89	39.18	+.30
Comparison Z (44)	41.66	36.44	-5.21	44.52	34.48	-10.03	52.45	36.36	-16.09
Effect Size			+.30*			+.90***			+1.10***

Note. Gains for school B represent the difference between 1993 and 1994 NCE scores for 2nd - 4th grade combined on the T-CAP achievement tests, for School C students in 2nd & 3rd grades combined and for School D students in 3rd & 4th grades combined. Students in comparison schools are from matched grades. [a]Effect size of about .3 is considered educationally important with .2 denoting a small*, .5 a medium,** and .8*** a large effect size. [b]School Y served as the comparison school for Cognet schools B & C at matched grades.

The results of Study 3 analyses on SAT scores are displayed in Tables 5 and 6. The means of the SAT total reading as well as total math scores for treatment group students prior to program implementation were near the 36th percentile. The comparison group's mean scores were near the 50th percentile in both reading and math. After two years of intervention, the COGNET students' mean scores improved to almost the 56th percentile for reading and more than the 64th percentile in math while the comparison group's average scores remained near the 50th percentile for both reading and math. In other words, the COGNET students increased on average 22.04 NCEs in math and 14.78 NCEs in reading while the control group's NCEs gain was .20 for math and -.94 NCEs for reading. When math and reading mean gain scores were compared simultaneously for both groups, the difference was significant (MANOVA, $p < .01$). Mean gain scores were significantly higher for the experimental group compared to the control group for both reading (t-test, 1-tailed, $p < .013$) and math (t-test, 1-tailed, $p < .001$). Gap reduction analysis confirmed the validity of these highly significant differences.

Table 5. Means and Standard Deviations for Reading and Math Scores of Academically At-Risk Children with and without the COGNET Program in Study 3

Variable		Comparison School X Pre	Post	Gain	COGNET School A Pre	Post	Gain
Reading	(n)	(29)	(29)	(29)	(29)	(30)	(29)
	X	49.63	49.68	-.94	39.11	54.04	14.78
	Sd	15.41	18.99	18.85	19.15	13.91	17.82
Math	(n)	(29)	(28)	(28)	(29)	(30)	(29)
	X	50.17	50.10	.20	39.36	60.82	22.04
	Sd	16.64	16.58	18.66	21.57	19.03	23.90

Note. Pre test means were calculated based on NCE scores from academically at-risk children's performance on the appropriate SAT Tests in Schools A & X for grades kindergarten through second. Post test means were calculated based on NCE scores for the same children who had received two years of the COGNET program in first, second, third and fourth grades. Gains represent the difference between pre and post means over the two year time period.

Table6. Results of T-test, MANOVA, and Gap Reduction Analysis for Reading and Math Scores of Academically At-Risk Children with and without the COGNET Program in Study 3

Variable	T-test	MANOVA	Gap reduction
Reading	$t(56) = 2.281$ $p < .013$	Wilks' Lambda $= .780$	9.65
Math	$t(56) = 3.264$ $p < .001$	$F(2,54) = 7.629$ $p < .001$	1.296

Note. The three tests were conducted using the data in Table 5.

In Study 4, the percent of COGNET students scoring below average in two COGNET schools decreased dramatically in reading, language, and math subject areas. In contrast, the percent of comparison school students scoring below average either increased (in reading) or remained essentially the same (in language and math). See Table 7 for a display of results.

Table7. Percent of Children Scoring Below Average on Achievement Tests for Groups with and without the COGNET Program in Study 4

	Achievement Test Categories					
	Reading		Language		Math	
Group	1991	1994 (n)	1991	1994 (n)	1991	1994 (n)
COGNET School B	72	48 (33)	62	30 (32)	48	19 (10)
COGNET School C	47	38 (29)	50	41 (27)	44	23 (26)
Compar. School Y[a]	44	57 (28)	50	50 (28)	38	39 (28)

Note. Percentage scores represent performance on the T-Cap for children who were 1st graders in 1991 and 4th graders in 1994. [a]School Y is environmentally similar to COGNET schools B and C.

Impact on Teacher Classroom Behavior

The results of studies investigating COGNET impact on teacher classroom behavior indicate the following: Change in Classroom Interaction Behavior: *Teachers in COGNET schools demonstrated more classroom behaviors that facilitate higher-order thinking and learning than do teachers in comparison schools.*

Design

This claim is based on two research studies both of which employ a comparison group after program design (Linney & Wandersman, 1991). The socio-political context of conducting field research in schools and school districts implementing an innovative educational program make experimental design impractical, at least, and perhaps even inappropriate (Conrad, 1994). It is a strength of both of these studies that the comparison school teachers were located in the same district, and treatment and comparison schools had similar status in implementation of compensatory education programs, e.g. school wide Chapter 1 designation. Traditional experimental statistical significance testing would be inappropriate for this type of educational research (Carver, 1993; Shaver, 1993). Two alternative statistical analyses were employed to strengthen the interpretation and generalization of findings from this design.

Sample

Both studies included K - 3 teachers from COGNET schools A, B, and C and environmentally similar comparison schools within the same LEA. The urban study treatment group included all K - 3 teachers with at least 2 years of COGNET experience and K - 3 teachers in a comparison school wide Chapter 1 school. All three schools are in the same school district and serve similar socio-economic and ethnic populations.

The rural study was conducted in school A and school X within the same school district in southern Appalachia. Similar cultural and socio-economic status exists at both rural sites and included 11 COGNET teachers and 13 comparison teachers.

Instruments and Procedures

Selected variables from the MLE Rating Scale (Lidz, 1993) were used for purposes of the urban study (see Attachment , Table 1). This instrument has been used in slightly altered forms in numerous other studies in a variety of situations. It is designed to measure characteristics of adults' interactions with children that are based on research in the field of early childhood education regarding variables that effect cognitive development and that support the theory of MLE (Lidz, 1991). The MLE Observational Analysis System (Greenberg, 1990) and the Teacher-child Dyadic Interaction System (see Attachment, Table 2) (Brophy & Good, 1969) were used for the rural study. The MLE system was developed prior to the COGNET elementary school program with the assistance of Feuerstein and colleagues at a research institute in Israel. The dyadic interaction system has been used for many years in numerous studies unrelated to programs based on the MLE theory. It allows researchers to study classroom interaction variables that facilitate or inhibit higher order thinking. Table 8 provides additional information.

Table 8. Instruments and Procedures for Teacher Behavior Claim

Instrument	Studies	Reliability/ Validity	Procedures
MLE Observational Analysis System (Greenberg, 1990)	Rural Study (1991)	85% interrater reliability	pairs of observers recorded consensus ratings on 13 variables for middle five minutes of 10 minute video segments per teacher/student group
Teacher-child Dyadic Interaction System (Brophy & Good, 1969)	Rural Study (1991)	90% interrater reliability	paris of observers recorded consensus ratings on 23 variables for middle five minutes of 10 minute video segments per teacher/student group
MLE Rating Scale COGNET Edition (Lidz, 1993)	Urban Study (1993)	78% interrater reliability	pairs of observers recorded consensus rating on 6 variables for 10 minute video segments per teacher/student group

Data Collection and Analysis

The data for both studies were collected through observational video tape analysis. All raters received a minimum of 10 hours training before each analysis began. A detailed set of scoring procedures were provided in writing for raters. Several university staff members monitored data collection and double

checked each stage of analysis. Effect size was used to determine the magnitude of change for the urban study and was calculated by subtracting the comparison teacher mean score from the treatment teacher mean score and dividing by the standard deviation of the comparison group. Correspondence analysis (Hoffman & Frank, 1986; Greenacre, 1984) was used in the rural study. Correspondence analysis is a data analysis technique that employs a nonlinear multivariate descriptive statistical method with the unique feature of allowing simultaneous consideration of multiple categorical variables.

Results of Teacher Behavior Studies

Large effects were found for COGNET teachers in the urban study at .9 for mediated learn variables of intentionality, transcendence, purpose of lesson, level of assistance, strategic teaching and change.

Table 9. Mean Ratings and Analysis of Classroom Interaction Behavior for Teachers with and without the COGNET Program

variable	COGNET Teachers	Comparison Teachers	Effect Size
n	(21)	(10)	
mean	12.40	10.60	.9***
SD	2.40	2.07	

Note. Classroom interaction behavior ratings are based on the mean of the total ratings for intentionality, transcendence, purpose of lesson, level of assistance, strategic teaching and change. An effect size of .9 is considered large.***

In the rural study, a correspondence analysis geometric, graphical approach of categorized the 27 teachers into four levels of use of mediated learning that could be interpreted as follows: No COGNET and 3 comparison teachers scored at Level I (low); 3 COGNET and 5 comparison teachers at Level 2; 4 COGNET and 3 comparison teachers at Level 3; and 3 COGNET and 0 comparison teachers at Level 4 (high) (Greenberg, Woodside, and Brasil, 1994). This analysis revealed that COGNET teachers scored at higher levels of use of mediated learning than did untrained teachers. In addition, COGNET teachers who scored at lower levels of mediated learning were not characterized by any variables that inhibit high level mediation as derived from the teacher-child dyadic interaction observational analysis. The same was not true for the comparison teachers who did display dyadic interaction characteristics that do interfere with high quality mediated learning.

Additional Studies of the COGNET Model

Study of Gains in Display of Intrinsic Motivation

Results of pre and post test of intrinsic motivation with 40 children from treatment school A and 23 children from comparison school X revealed similar scores for both groups before COGNET implementation and significantly higher post test scores for the treatment group after 2 years of intervention (t-test, 1-tailed, $p < .021$). Multiple Analysis of Variance of data from observational analysis of four efficient cognitive functioning behaviors (voluntary comments, seeks clarification, affirms statement, and describes plan) revealed significant differences between children from school A and comparison school X, with the COGNET means higher (MANOVA, $p < .016$).

Study of Student Differences on a Test of Attention

Results of a dynamic assessment test of attention (pre test/cognitive intervention/post test model) revealed significantly higher scores on both pre and post tests for a treatment group of 16 students in an urban Detroit elementary school over a comparison group of 29 students from an environmentally similar classroom [pre t-test ($p < .01$) and post t-test ($p < .05$)]. These results indicate that the COGNET students displayed better attention abilities than the comparison students and that they benefitted more than did the comparison students from the intervention phase of the test (based on their post test scores which focused on strategies for how to attend more effectively).

Study of Student Classroom Behavior

A class of 20 students in 2nd grade (17 of whom were identified as special needs students) in a culturally diverse school in Oklahoma received the COGNET program for one year. A pre and post measure of 41 classroom behaviors revealed a correlated-sample t-test result of significant gain ($p < .0001$) indicating improved performance in terms of desirable behavior. This study is supported by anecdotal information provided by teachers at other COGNET schools who stated when interviewed that students were able to learn beyond the realistic expectations of the teacher, students' motivation to learn changed dramatically, and that students were able to use COGNET principles to solve social interaction problems in the classroom.

Studies of Parent Involvement for Parents in COGNET and Comparison Schools

Parents of children receiving the COGNET program at school A responded differently when interviewed than did parents at comparison school X. Both groups wanted their children to do well in school but COGNET parents also associated school with "good employment." COGNET parents could

describe more specific ways in which teachers could help children approach tasks than could comparison parents. In addition, COGNET parents reported a strong belief that parents can really make a difference in how their children learn and could discuss specific ways that they could motivate their children and techniques for assisting them. Comparison parents held a somewhat similar belief but were not consistently clear on how they could help their children.

Conclusion

Teachers who gained an understanding of mediated learning and its importance in the classroom exhibited characteristics in their interactions with students different from those of the comparison teachers. Such teachers were more deliberate in determining that their students (1) were paying attention to the content of the interactions, (2) understood the significance of thinking and learning concepts within the lesson, and (3) connected lesson content to previous and anticipated events in other settings. These teachers responded to student cues and adjusted lessons so that learning was challenging but not overwhelming to individual students. In addition, they facilitated opportunities for individual learning without providing unneeded assistance. Teachers allowed time for students to work through problems. Finally, COGNET teachers emphasized the learning process as well as paying attention to the product.

Students in classes where teachers displayed these positive characteristics and who gained an understanding of how to learn, should approach tasks less impulsively, with greater intrinsic motivation, and with the knowledge of how to solve problems and reach goals. As a result these students made greater gains than comparison students in both academic and novel task performance. Their achievement test scores were significantly higher than those of an equivalent comparison group.

COGNET's unique design and proven theoretical base (Feuerstein's theory of MLE) provide a decisive advantage in teaching learning to learn and basic academic subjects to both high risk and other children. The use of the Building Blocks of Thinking, Tools of Independent Learning, and mediated learning experiences assure teachers that each child will make significant improvement in subject matter skills as well as gains in cognitive ability and in assuming personal responsibility.

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Table 1

Mediated Learning Experience Variables

Intentionality - the degree to which the mediator deliberately guides the interaction in a chosen direction
Contingent Responsivity - the degree to which the mediator responds verbally or nonverbally to the children's behavior in a timely and appropriate manner (Lidz, 1989)
Transcendence of Domain-Specific Knowledge - any transcendent connection between the content of the given domain and the content of some other domain
Subjective Meaning - any verbal expression of a degree of worth that exists in the mediator's mind
Affective Meaning - any nonverbal expression of affective engagement of the mediator with the children (Lidz, 1989)
Mediation of Self-regulation - any means the mediator employs to assist children in controlling their approach to a given activity
Transcendence of General Strategic Knowledge - any trinscendent connection between the given domain and cognitive processing of that domain
Objective Meaning - any verbal expression of a degree of worth or significance in which a connection is made to actual features and characteristics of some aspect of the domain
Task Regulation - the quality of intervention provided by the mediator to a child who displays difficulty in the given situation (Lidz, 1989)
Praise/Encouragement - the quality of comments made by the mediator to inform children that their performance was good (Lidz, 1989, adapted)
Mediation of Goal Directedness - the degree to which the mediator helps children think in terms of a goal or purpose (Lidz, 1989, adapted)
Reciprocity - the level of receptivity of the child to the mediational intentions of the mediator (Lidz, 1989)
Level of Thinking Elicited from Children - the degree of higher or lower level thinking required from the children as they respond to the mediator's intent

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Table 2
Question Dyad Interaction Variables

Response Opportunities - classroom situations in which a child publicly attempts to answer a question posed by the teacher

CDR	Child Direct Question - teacher asks question of child who has not sought the opportunity to respond
COP	Child Open Question - teacher asks question, waits for children to indicate a desire to respond, and then calls on one child
CCA	Child Call Out - child calls out an answer before the teacher calls on a given child

Level of Questions - level of response demand made upon the child

QPC	Process Question - requires child to integrate facts or make inferences in order to respond correctly
QPR	Product Question - requires child to merely recall a specific fact in order to respond correctly
QCH	Choice Question - requires child to choose among expressed or implied alternatives in order to respond correctly
QSE	Self-Reference Question - requires child to relate personal experiences, preferences or feelings in order to respond correctly

Child's Answer - the degree of accuracy of the child's response

APC	Correct Answer - child's response satisfies the teacher
APN	Partially Correct Answer - child's response is considered correct but incomplete by the teacher
ANE	Incorrect Answer - child's response is considered unsatisfactory by the teacher
ANR	No Response - child does not respond or indicates does not know

Terminal Feedback Reaction - teacher behavior which ends the interaction

FPP	Praise - teacher communicates a positive evaluation or a warm personal reaction by verbally complimenting the child
FAF	Affirmation Feedback - teacher provides impersonal feedback, without communicating a personal reaction, which indicates that the response is acceptable or correct
FO	No Feedback Reaction - teacher makes no verbal response to the child's answer and does not nonverbally communicate affirmation or negation of the answer
FNW	Negation Feedback - teacher provides impersonal feedback, without communicating a personal reaction, which indicates that the response is unacceptable or incorrect
FPC	Process Feedback - teacher reviews the question and discusses an approach to the task or elaborates on the process knowledge involved
FGA	Gives Answer - teacher gives the answer when the child's response was not considered correct
FAO	Asks Other - teacher asks another child to answer the question for the one provided with the response opportunity
FCA	Call Out Feedback - another child calls out the answer before the teacher responds to the first child's response

Sustaining Feedback Reaction - teacher behavior which prolongs the response opportunity by providing a second chance for the child to deal with the same or related questions

SRE	Repeats Question - teacher asks the question a second time in a similar manner and directs the question to the same child
SRC	Rephrase or Clue - teacher states the question differently or provides some additional information in an attempt to make the original question easier to answer
SNE	New Question - teacher prolongs the interaction by asking the same child a new question which requires a different answer than that for the original question

Adapted from Brophy, J., & Good, T. (1969). *Teacher-child dyadic interaction: A manual for coding classroom behavior* (Report Series No. 27). Washington, D.C.: Office of Education.

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